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ORDER OF DEVELOPMENT OF THE PRIMAL SHAPING ARTS.

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W. H. HOLMES.

FROM THE SMITHSONIAN REPORT FOR 1901, PAGES 501–513.

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ORDER OF DEVELOPMENT OF THE PRIMAL SHAPING ARTS.[a]

By W. H. Holmes.

Modern science has gone far toward establishing the proposition that the human race, like the various other groups of sentient beings, is the product of evolutional processes, and the student of history has added the corollary that human culture has likewise developed through a long series of progressive stages from infinitesimal germs up to the present complex and wonderful conditions. The history of culture can not, therefore, be complete until the course of its development has been traced back to the remotest beginnings. The phenomena of art are the tangible representatives of human progress and achievement, and upon these we are almost wholly dependent for an insight into the initial stages of history. Furthermore, there is a shadowy interval at the very beginning of culture history unrepresented by art remains. Into this space we seek to extend our vision by the aid of rays borrowed from other branches of science.

Assuming the general uniformity of nature's genetic processes, we conclude that in the beginning there was a period of rudimentary or instinctive use of materials during which our race carried on its activities much as the bird builds her nest of sticks and grass and the badger burrows a home in the ground. But the time must have come when the hand of this creature, man, was so developed and his brain so matured that articles supplied by nature, such as sticks and stones, were held in the hand for throwing, striking, and rubbing. These things became implements, multiplying the powers of the hand and finally giving man dominion over nature.

The first stage of implement using would consist in the employment of articles furnished by nature. The second stage would be entered upon when the things used began to be modified in shape designedly to increase their efficiency. The passage from the first to the second stage would be made possible by unintentional alterations of the primal utensils brought about through use, and the observation of the processes of modification by creatures able to profit by these observations. This stage would witness the beginning of those manual operations to which we give the name "the shaping arts." It is these first necessary steps in art, weak and hesitating and almost infinitely slow as they must have been, that more than any others demand the attention of the student of history.

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[a] From the Proceedings of the American Association for the Advancement of Science, Vol. XLII, 1894.

There is little prospect of securing examples of the earliest products of men's hands, as they were probably executed in destructible materials and have long since disappeared. As soon, however, as the shaping operations extended to stone, permanent records were made and many artifacts, representing all stages and periods, are still extant, forming the only actual evidence of the early struggles and achievements of the race. Archæologists are engaged in collecting these remains and arranging them according to the plan suggested by the general scheme of evolution, applying the result to the elucidation of human history.

Consideration of the entire body of phenomena of art in stone is not possible in the present study, and I shall confine myself to a small portion of the field—to the initial stages.

A glance at the accompanying synopsis will convey a definite notion of the relation of the group of phenomena here to be considered to the whole field of the shaping arts. These arts may be divided primarily into manual and physical groups. The first includes all those things shaped directly by the human hand, aided by mechanical appliances; the second includes those in which the manual operations are assisted by physical processes or agents, such as heat, acids, and electricity.

The manual arts employ mainly six groups of processes, to which I have given the names fracturing, bruising, abrading, incising, modeling, and constructing. Four of these groups—the four placed first in the synopsis—are concerned in our studies of the earliest culture, and pertain to the shaping of stone in its elementary utilization.

SYNOPSIS OF THE SHAPING ARTS.

- Shaping arts
  - Manual arts
    - 1. Fracturing – Splitting, breaking, flaking, etc.
    - 2. Bruising – Battering, pecking, etc. bushing,
    - 3. Abrading – Grinding, rubbing, polishing, etc.
    - 4. Incising – Cutting, incising, piercing, etc.
    - 5. Modeling – Molding, stamping, hammering, etc
    - 6. Constructing – Building, weaving, sewing, etc.
  - Physical arts
    - 1. Heat fracture.
    - 2. Explosion fracture.
    - 3. Etching.
    - 4. Electro-depositing.

ORIGIN OF MANUAL PROCESSES.

Taking the evolutional view of the development of man and his arts, we must first turn our attention toward the probable activities of the creature man as he issued from the prehuman stage and began slowly to make use of the objects with which he was surrounded for implements and utensils. By the utilization of stone in the form of fragments, nodules, and bowlders, the properties of that material would be gradually revealed to him, and in time four processes of modifying its shapes would inevitably be suggested and utilized. These are fracturing, bruising, abrading, and incising.

FRACTURING PROCESSES.

The fracturing processes are placed first for reasons that will appear in the sequel. As known tó us, they employ two groups of acts, percussion, and pressure. The first of these implies the use of a hard and heavy implement with which the stone to be shaped is struck, producing fracture; the second implies an implement of at least moderate hardness, which is pressed against the brittle stone, producing fracture. These necessary acts—the simple manual operations—are so elemental as to be within the reach of man in a very low stage of mental and physical development. The first—percussion—probably the only act employed in the auroral days, demands nothing more in the way of skill than that required in the casting or striking of one stone against another, or that required in the cracking of a skull or a nut. In the operation of this process a hard, compact hammer of stone or other suitable material having a convex striking surface is essential. The second process—pressure—is less primal, requiring, before it can be operated with success, a specially prepared tool of hard wood, bone, or other compact substance. The several varieties of acts employed in fracturing are named, according to the nature of the particular results produced, "breaking," "splitting," "flaking," and "chipping." The term "flaking" is in common use to represent the form-elaborating operations of the group. The material shaped must be measurably compact, homogeneous, and brittle. Such stone is widely distributed over the habitable world.

BRUISING OR BATTERING PROCESSES.

The acts employed in this class of operations are wholly or in the main percussive, the impact resulting in a bruising and crumbling of minute portions of the surface of the stone. The hammer employed must be hard and tough, and the stone shaped must be sufficiently tough to practically preclude fracture by the ordinary blow. The simple act, like that required for fracture, is quite elemental and within the reach of a creature of low organization. No specialized tool is necessary, the result being reached by striking one stone against another of proper relative durability. The several acts are known as "battering," "bruising," and "pecking," the last term being in common use for the act by which shaping is mostly accomplished by primitive peoples. Materials suitable for shaping by this process are plentiful and very generally distributed.

ABRADING PROCESSES.

Shaping by abrasion in its most elemental form results from the rubbing of one object against another with such force as to remove minute particles from one or both. The operations are generally expressed by such terms as "grinding," "rubbing," and "polishing." All stones are abradable, and most stones can be made to serve in the active operations of abrading. The act is so simple that it may be performed by any creature having power to grasp the rubbing stone. Its employment in the shaping arts was undoubtedly primal, although it may be hard to secure tangible evidence on this point.

INCISING PROCESSES.

The incising acts are also simple in their nature. In their most elementary form they are practiced by all creatures having teeth and nails. In art they include the shaping of materials by cutting, piercing, picking, scraping, etc. They imply the use of a hard edged or pointed tool and a substance to be shaped somewhat less hard. Though a primal art, it is doubtful whether incising was applied to the shaping of stone in the earliest times. This appears from the permissible assumption that stone soft enough to be cut and scraped would not be required in the simple acts of food-getting and defense, and the making of vessels, pipes, ornaments, and ceremonial objects did not form a part of the accomplishments of the early days.

There are a number of well-known shaping operations that combine one or more of these processes, or that pass imperceptibly from one into the other. Cutting and drilling often combine the bruising with the incisive methods. Sawing may be done with an abrading edge or with serrations that incise. Boring is likewise accomplished either by cutting or by abrading points and edges.

From this brief analysis of the four simple primal shaping acts, and a consideration of their relations to the mental and physical powers of auroral man, as well as to the available materials of his environment, I believe it impracticable to reach any conclusion as to which of these acts would first be consciously employed and intelligently and generally utilized in shaping stone. But there are other criteria which may assist us in the attempt to place them in their proper sequence and relations to culture progress.

ORDER OF ARTS DEPENDENT ON MEN'S NEEDS.

A study of the elemental shaping acts does not aid us in determining what particular art would take precedence or what variety of art product ought to characterize the earliest periods of human history. If, however, as appears to be the case, the four shaping processes were equally within the reach of man when art began, it does not necessarily follow that all would come into general use at or even near the same time or stage of advancement. It is not the simplicity or discoverability of a shaping process that decides the order of its adoption. The question is rather as to whether or not it is better suited than any other process for supplying human wants. The simplest process possible, though in operation before man's eyes from the beginning to the end of his career, would never come into use did it not subserve the requirements of his existence. The assertion may be safely made, therefore, that, capacity and environment being uniform, the shaping process that would directly supply a permanent or frequently recurring need not otherwise supplied would be the first process generally utilized.

A study of human needs in the auroral days may assist in throwing light upon the order of succession and course of development probably taken by the implement-producing arts. Let us inquire what devices would naturally be called for in supplying primal needs; first the need of food, second the needs of defense and offense, third the needs of shelter and clothing, fourth the needs of transportation. The need of food is a first and ever present incentive to activity, and in early periods man's ingenuity must have been constantly exercised in securing a sufficient and permanent supply. Food getting would lead to the development of varied activities, and call into use all available manual aids. It would certainly in time lead to the multiplication and specialization of utensils, thus opening the way for progress in the shaping arts and the evolution of culture.

It is necessary, then, to inquire as to the probable nature of the artificial devices that food getting and preparing would call into existence. The devices employed would depend on the nature of the food resources available to primitive man. The question is complicated by the fact that environment is far from uniform, and that the food resources vary with the habitat. Yet, considering general conditions only, we are able to reach measurably satisfactory results. Whatsoever man's habitat, his food resources were limited to the products of animal and vegetable life, or to both combined, and, so far as the use of stone is concerned in dealing with these substances, it is safe to say that two classes of implements and only two would be in constant demand. First, roundish or blunt stones would be needed for throwing, striking, crushing, breaking, grinding, etc.; second, sharp or incisive stones would be demanded for cutting, piercing, digging, scraping, and the like. The same statement may be made with respect to the stone tools applicable to purposes of defense and offense, and available in activities pertaining to shelter, clothing, and transportation.

These two general classes of stone implements fulfilled, so far as stone could fulfill them, all the requirements of man's existence in primal days; and if the question were limited to that of the relative need of blunt and sharp stones in the practice of the arts, we should be compelled to say that no distinction could be made, that one class could not claim precedence over the other in usefulness or in period of utilization.

A QUESTION OF SUPPLYING WANTS NOT OTHERWISE SUPPLIED.

But it should be most carefully noted that the question is not one as to the comparative usefulness of these forms of implements, or even of the period of their adoption, but of their production as works of art. Which form would man first be induced to shape for himself, thus adding a group of artificial utensils to his simple list of adapted appliances? If, as seems to be the case, both classes of tools, the blunt and the sharp, are equally essential to man, the question becomes one of natural supply. If nature furnished all that was required in the way of tools, art would not be called on to produce them. If nature supplied one class meagerly and the other abundantly, the meager class would be added to by artificial means. Now if we review the various regions of the world that could have served as the abiding place of auroral man, we find that the rounded stone—the breaking, bruising, grinding stone—is nearly everywhere more readily obtainable than the cutting, piercing stone. The former, being ready at hand, would be at first most freely utilized and for a long time utilized in the natural state, while the latter, being also known and used, yet comparatively rare, would be artificially produced as soon as the capacity to do so was developed.

The artificial sharp stone, the intentionally shaped sharp stone, would thus naturally have precedence as an art form over the intentionally shaped rounded stone. It would probably be the first representative of the shaping art in stone to come into general use. But there are other points to be considered.

OPERATION OF THE PRIMAL SHAPING ACTS.

Incipient stages.—We must now look more fully into the operation of the four elementary stone-shaping acts—into the beginnings of the arts to which they give rise. It is important to note that the act, the essential element of the process, is not necessarily an index of the simplicity or ease of its utilization. The ease of the first step in a long and tortuous pathway does not determine the ease of the journey. The ease of the first shaping act does not determine the ease of operating it in such a way as to produce a desired and final result. We observe that in art a desired and definite result may be obtained by a single shaping act, or that a succession of acts may be required. It is also clear that the acts may increase in difficulty as the operations proceed. The intelligence that directs a first act to secure a definite and immediate result may not be equal to the task of directing a series of acts, howsoever simple, aiming at a remote result. In general it may be said that a single-act result would be the first designed result reached and repeated in the shaping arts. A two-act result would follow, and would precede those that depend upon ten, twenty, a hundred, or a thousand acts. Let us examine the four primal stone-shaping processes, fracturing, bruising, rubbing, and cutting, with respect to this point. What is each capable of accomplishing under the simple, elementary conditions that must be assumed for the incipient days of mind and art? Of the four processes, that which produced an immediate, palpable, available result would be first utilized. The fracturing act, the blow upon a brittle stone, would beyond all dispute be that process. Such a blow produces at once one, possibly two, keen-edged tools having forms admirably suited to the common and ever-present needs of the man who must rend flesh, dress skins, cut wood and bone, and dig roots.

On the other hand, the bruising blow, the shaping act by means of which tough stones are shaped, produces an almost imperceptible effect on the stone struck; there is no suggestion of a useful result—a result that could add to the availability of ordinary natural forms. The nearest useful result is far away and obscure, and withal, even when reached, not measurably superior to the forms freely furnished by nature. The dullest mind would be able to understand and utilize the simple fracturing act, but would hardly grasp the nature and possible results of a process so obscure as that of bruising or pecking a piece of rock into definite and unaccustomed shape. This is well illustrated by the almost total failure on the part of students of archæology to understand the operation of the pecking process in its details until elucidated by recent experiments of Mr. J. D. McGuire. The cultural interval between the general practice of the two processes—flaking and pecking—would cover, in all probability, a considerable period of progress.

More advanced stages.—The operation of the shaping processes may be still more fully analyzed and surveyed with relation to actual known implements. The brittle stone to be more than simply fractured must be held in the hand and struck with another stone. The stone to be bruised into shape must also be held in the hand and struck with another stone. The positions may be the same, the shapes the same, and the act the same. The brittle stone is struck and is broken, producing perhaps a cutting or piercing tool. A second blow produces a second tool, and also modifies the shape of the stone held in the hand. A two-blow tool has thus been made in shaping one-blow tools. By the time ten tools or flakes have been made the portion held in the hand has been shaped by ten blows not directed to its own development, but shaping it adventitiously as a nucleus or core. The results are so well defined and tangible that they could not escape observation, and further experiment would be encouraged. Skill to accomplish soon follows where wants direct the effort, and tangible results are at once attained. From the initial steps of intentional flaking the way would be always open to the achievement of higher and higher results. Advancement could not, however, be rapid; wants had to develop, conceptions ripen, skill increase, and methods differentiate by infinitesimal increments, and the highly specialized flaked implement is possibly as far away from the first designed stroke in flaking stone as the printing press is from the well specialized flaked implement of savage days.

On the other hand, again, the hard, tough stone fitted for elaboration by pecking is struck by the hammer stone, and the only result is a slight crumbling of the surface—a little white dust. There is no suggestiveness, no recognizable step of progress in this result, and even if a hundred blows were struck, no measurable progress would be made toward any tangible result, for a definite conception must be in the mind and a clear notion of how to realize it as well before such result would be possible. So far, then, as the pecking process of itself is concerned, it stands little chance of primal utilization as compared with the flaking process.

But is it possible that a suggestion of the utilization of pecking could come from outside sources, from practice of the simple operations of food preparation? In cracking nuts or pounding seeds (for these must have been among the primal activities), the stones employed would through wear finally exhibit slight concavities. The stones used in the hand would also be modified in shape by striking and rubbing. Could such suggestions possibly give rise to the independent use of these operations in shaping implements of stone? It is not quite clear that the shaping accomplished in the mere routine of use would suggest to the very simple mind the idea of shaping in the abstract, for the shaping in use was adventitious and not necessarily observed. It seems likely that man would go on indefinitely using what nature and adventition supplied unless there was some positive suggestiveness in the results accomplished or some very exceptional exercise of forethought. Certainly the tedious pounding and abrading processes blindly operated in food preparation would, in primal days, stand little chance of being applied to the shaping of tools and utensils of specialized shapes and uses, and especially to the production of implements with sharp points or cutting edges.

The natural tendency of the pecking blow is to blunt and destroy all edges, and the process would have to be diverted from its natural channels by strong forces to make it produce anything like an edged tool; the conception of such a use would have to be acquired by familiarity with edged tools of other classes and materials. The celt, gouge, and grooved ax are the principal implements made by pecking and grinding in common use among savage peoples. These can not be primal forms, as they represent ripened conceptions, specialized technique, skillful manipulation, and highly differentiated uses and methods of employment. They are practically without ancestry in their own line. Altogether there seems to be little or no art produced by the pecking and grinding processes that could be safely assigned to primal times, save such adventitious shaping as comes from use. An examination of pecked tools reveals the fact that in very many cases the process supplements that of flaking, and it is not impossible that it was first brought into notice and use as a means of getting rid of irregularities and excrescences commonly resulting from imperfect fracture. Pecking would inevitably be suggested in the progress of flaking operations, first, by the effect on the hammer stone, which is modified and specialized by repeated contact with the stone flaked; second, by repeated efforts to remove flakes where the stone happens to be especially refractory. The repeated blows bruise the stone, modifying its shape, and suggesting the possibility of shaping by this means. The abrading processes might also be suggested in similar ways, and especially by the use of flaked tools in operations which modified and polished their edges.

Both the pecking and rubbing processes are especially adapted to elaboration and finish, and are poorly qualified to deal with shapes not already approximate. They did not attain their highest usefulness until superstition and æsthetics became factors in art, encouraging elaboration of form and delicacy of finish.

The accompanying diagram expresses in the most general way my conceptions of the probable relationships of the four shaping processes to the stages of culture progress. The accumulation of additional data will in time enable us to express these relations more fully and with more certainty, but the task is beset with difficulties, for the reason, mainly, that the origin and progress of these arts are not uniform among all peoples. The genetic columns can at best but express generalizations, and are largely hypothetical.

The column representing the development of fracturing arts, so far as it relates to the earliest times, is based on the observations and inferences already presented. The flaking act was a primal act, and the dotted line descending into the pre-human stage indicates this. On crossing the line—or soon after crossing the line—separating the pre-human from the lowest art stage, I assume that the act was first utilized in the art sense, and that progress began. Being a simple act, and constituting, as operated in fracturing stone, a simple process giving immediate, tangible, and available results, I conceive that its use would increase rapidly through early savage times, dominating the other stone-shaping processes of that period and culminating in late savage times. The employment of the group of processes developed from the simple fracturing act probably decreased to a considerable extent in barbarian times as other processes came into prominence, but it has continued in active use, especially in quarrying and roughing out stone, for all classes of works, architectural, sculptural, and miscellaneous, up to the present day.

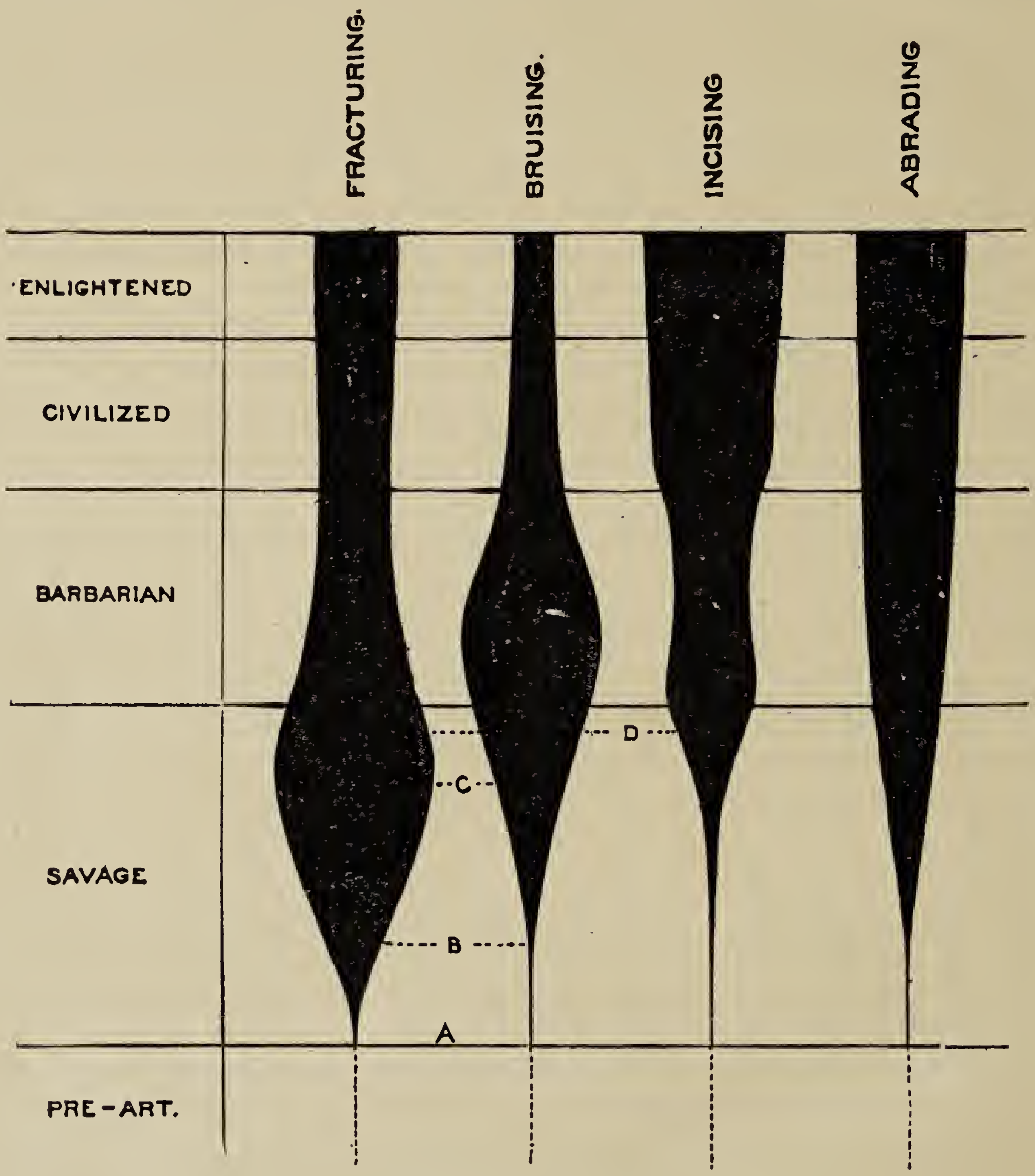

Diagram of relative progress.

The second column is intended to indicate the development of the arts which shape stone by bruising and crumbling its surface. I have already explained why the process in its simplest form may be considered primal, as having its origin in the pre-human stage of man's history.

Its use in shaping must have been suggested to man at a very early stage of art development, and the lines of the diagram are allowed to expand gradually throughout the savage stages of progress. Observing the obscurity of the effects of the bruising act, the long series of operations necessary in producing the simplest art form known, and the comparative rarity of pecked implements that would fitly characterize the beginning stages of culture, the column has been made to expand very slowly at first, widening rapidly in barbarian times, during which pecked stone seems to have taken the lead among many peoples as a shaping process. The process in its purity appears to have fallen somewhat into disuse in civilized and enlightened times, the acquirement of hard metal tools having given incisive methods a very decided advantage. The fact is, however, that the shaping of hard stone by means of metal chisels partakes of the nature of a compromise between the cutting and bruising processes.

The germ of the incising arts must have come up with man from the state of nature as distinguished from the state of art as expressed in the third column; but the development would be slow, on account, first, of the absence of hard cutting tools, and, second, the absence of stone that could be cut with ease into useful forms. An expanding is indicated in late savage times, during which it is assumed that peoples began to use soft stones for vessels, ornaments, and ceremonial articles. The fact that the soft stones had, as a rule, to be quarried, probably retarded the development of this process. Again, when hard metals came into common use in late barbarian times and in early civilization stone cutting took a prominent place in the arts, and has never since yielded its ground.

The history of the abrading processes is a very interesting one, but as indicated in the diagram there have been few viscisitudes in their progress. Beginning near the threshold of art, they advanced but slowly, serving mainly as an auxiliary to the other processes, being devoted especially to finish and beautification.

INFLUENCE OF ENVIRONMENT.

In discussing a scheme of evolution for the shaping arts, I have assumed what I conceive to be average conditions of environment; that is to say, an environment where all ordinary materials are present and available in like proportions. It is apparent, however, that determinations based on such an assumption, even if correctly made out, may not agree with the actual order in the earliest development of art. The environment of the first group of men may have contained all the ordinary elements of stone art, or it may have been without one or more of these elements. If it did not contain varieties of stone suitable to each process, then there would be a disagreement between the ideal order as here worked out and the real order.

But the race may have been scattered over a wide region at the period of the birth of art, separate groups having distinct ranges of mineral resources. Great diversity of art conditions would thus result. The group deprived of brittle stone would develop its lithic art—no doubt very slowly—through the bruising, grinding, and cutting process, and flaked objects would be practically unknown. The group having only brittle stone would have but meager traces of pecking and cutting operations, and flaked art would have full sway. To cover the ground fully, a separate culture chart would have to be constructed for each group of isolated peoples, for the flaked-stone age of one would occupy the position on the chronologic scale required for the pecked-stone period of the other. But the lines between mineral regions are not usually hard lines, and communities of men, howsoever primitive, are not fixed in habitat. Arts change with change of place and consequent change of environment; and, taking the sum total of the conditions under which a large number of groups of men would live, the mean result must, it seems to me, correspond somewhat closely to that expressed in the diagram, which makes the four primal shaping activities synchronous in origin but indicates different rates of development.

Although expressing the view that the exclusive use of a single shaping process or a group of such processes for a long period seems improbable, I do not wish to antagonize the idea of a flaked-stone period in western Europe. My diagram allows for such a period, covering the space from A to B. That such a period should exist, even in approximate purity, however, until the highest flaked forms were developed, as to C, and until a graphic art equal to the realistic delineation of men and animals on bone and ivory, say to D in the incising column, should exist and flourish, is, in view of the considerations brought forward in this paper, not within the range of probability.

CONCLUSION.

This brief study can not assume to be more than an outline of the general subject. Prolonged investigation is essential to the completion of such a work. I have sought means of approaching and examining that part of primeval history not within the ordinary scope of research. Through an analysis of the elementary shaping processes—the agencies by means of which man gained his sway over nature—I have undertaken to determine the order in which these operations would probably originate and develop, and thus to place the varied art products to which they give rise in their proper relations with one another and with the successive stages of unwritten history.

Such studies can not add greatly to our actual knowledge of events, although they may serve a good purpose in confirming or discrediting conclusions reached by other means, but they will materially assist in preparing the way for an intelligent consideration of those meager shreds of history that extend, like the edge of a frayed garment, back into the realms of the unknown.

The present study suggests the need of conservatism in interpreting the scattered records available to prehistoric archæology. Where the conditions under which men have lived are so varied, there must needs be great diversity in art achievement, and the order of the steps of human progress established in one region can not be applied with safety to another or to all, notwithstanding strong tendencies toward uniformity. Regional art groups must be examined primarily in the light of local conditions, and general results are to be reached by a comparative study of these special results. The actual order of progress of the race in the primal stages can never be absolutely known; and thus it is that hypothesis is called upon to supply an order of events consistent with what is known of the laws of life and art.